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PREZZO
52-54 HIGH STREET
SALISBURY
WILTSHIRE

TREE-RING ANALYSIS OF TIMBERS

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PREZZO, 52-54 HIGH STREET, SALISBURY, WILTSHIRE; TREE-RING ANALYSIS OF TIMBERS

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SUMMARY

Analysis by dendrochronology was undertaken on 12 samples from the roof and first floor structural timbers to this building on the High Street in Salisbury. This analysis produced a single site chronology comprising ten samples, this site chronology being 160 rings long overall. These 160 rings were then dated as spanning the years 1203–1362. Interpretation of the sapwood and the heartwood/sapwood boundaries on the dated samples indicates that the majority of these timbers were all cut together as part of a single episode of felling, this felling taking place in late 1362 or very early (ie, before the summer) of 1363.

One timber, however, appears to have been felled earlier, this felling taking place in 1293.

The two remaining samples are ungrouped and undated.

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Introduction

This Grade II* listed building, currently operating as a restaurant of the Prezzo chain, stands on the corner of High Street and Crane Street, a short distance from the gateway into the close of Salisbury Cathedral (SU 14260 29795, maps Figs. 1a/b)

The official listing entry, which states the building is of 14-15th century date describes it thus: '*2 storey. 3 gabled front of massive timber framing, plaster infilling, and old tile roof, the upper part in original condition and slightly overhanging ground floor, which has been completely altered with plain shop fronts on north and east fronts. Each gable has a 3-light leaded casement. The Crane Street front of similar design but additional attic gables and 2 light easement to attic and 1st floor. Small later painted brick extension right hand with Cl9 window. Single storey early Cl9 extension along Crane Street for double shop front with 3 light thin mullioned windows, central glazed door. Doric pilaster frame, plain frieze and shallow reeded cornice. Gable end tiled roof. Interior of original building retains roof structure with scissor brace trusses, tie beams, purlins curved windbraces. 1st floor room has painted plaster panel'.*

There is a further description and an isometric drawing of the building at the British History Online entry *https://www.british-history.ac.uk/rchme/salisbury/pp66-72*

Sampling

Wiltshire Buildings Record as a group has been investigating historic buildings in Wiltshire and charting their evolution since 1979, the archive now containing over 20,000 records including reports, photographs, plans, drawings, newspaper articles etc. A series of informative and accessible books have also been published. Since 2013 an on-going dendrochronology project has been looking at early roof types in particular, this having considerably increased the understanding of their development.

As furtherance of this programme of tree-ring dating, a funding application was made to the Vernacular Architecture Group to continue to study key Wiltshire buildings with early or unusual carpentry, and relating them to other buildings in the County. Amongst those selected was 52–54 High Street, Salisbury, a prominent and iconic timber-framed building forming part of a collection of historic buildings close to the approach to the Cathedral. Although the ground floor has been altered a little over the years to accommodate a variety of commercial uses, it retains a near complete original timber frame structure to the first floor and roof. It has been the subject of a drawn survey (and report?). In this context it is hoped the Wiltshire Buildings Record would add interest and value to the VAG conference in Wiltshire in April 2025, the intention being to complete the dating project in advance in order that the results may be presented at that meeting.

Thus sampling and analysis by dendrochronology of timbers were commissioned by the Wiltshire Buildings Record, the work being funded with the aid of a generous grant from the Vernacular Architecture Group. It was hoped that tree-ring analysis might more accurately and reliably determine the date of the building, and perhaps demonstrate its relationship to others in the locality.

An initial examination of this building showed that there was considerable amount of timber to this structure, all of it seemingly of oak. It was also seen that while a few timbers may have been derived from faster grown trees with somewhat lower ring numbers, the great majority of timbers were derived from slow-grown trees, and thus to have sufficient numbers of annual growth rings for dendrochronological analysis. Thus, from the suitable timbers available to the first floor and roof (the ground floor being less accessible due to its function as a restaurant), a total of 12 samples was obtained by coring. Each sample was given the tree-ring code PRE-Z (for 'Prezzo'), and numbered 01–12. An attempt was made to distribute these 12 samples amongst the various areas of the first floor, and to both structural wall timbers and to the roof timbers.

Details of the samples are given in Table 1, including the timber sampled, the total number of rings each sample has, and how many of these, if any, are sapwood rings. The individual date span of each dated sample is also given. In this report the frontage of the building, is deemed to face west, onto the High Street, with Crane Street fronting the building to the north. The sampled timbers are identified in a series of annotated photographs, Figures 2a–d, with the approximate positions of the sampled timbers being shown in the plan, Figure 3.

The Nottingham Tree-ring Dating Laboratory would firstly like to very much thank the manager, Ewelina Zurowska, and staff at Prezzo for allowing tree-ring dating of this building to be undertaken, and for the help and cooperation on the day of sampling. The Laboratory would also like to thank the Wiltshire Buildings Record for supporting this programme of work, in particular Dorothy Treasure, for helping with gaining access to the building. Finally, we would like to thank the Vernacular Architecture Group for their generous support for this project.

Tree-ring dating

Tree-ring dating relies on a few simple, but quite fundamental, principles. Firstly, as is commonly known, trees (particularly oak trees, the timber most commonly used in building construction until the introduction of pine from the late eighteenth century onwards) grow by adding one, and only one, growth-ring to their circumference each, and every, year. The width of this annual growth-ring is largely, though not exclusively, determined by the weather conditions during the growth period (roughly March–September). In general, good conditions produce wider rings and poor conditions produce narrower rings. Thus, over the lifetime of a tree, the annual growth-rings display a climatically influenced pattern. Furthermore, and importantly, all trees growing in the same area at the same time will be influenced by the

same growing conditions and the annual growth-rings of all of them will respond in a similar, though not identical, way (see Fig 4).

Secondly, because the weather over a certain number of consecutive years (the statistically reliable minimum calculated as being 54 years) is unique, so too is the growth-ring pattern of the tree. The pattern of a shorter period of growth, 20, 30**,** or even 40 consecutive years, might conceivably be repeated two or even three times in the last one thousand years, and is considered less reliable. A short pattern might also be repeated at different time periods in different parts of the country because of differences in regional micro-climates. It is less likely, however, that such problems would occur with the pattern of a longer period of growth, that is, anything in excess of 45 years or so. In essence, a short period of growth, anything less than 45 rings, is not reliable, and the longer the period of time under comparison the better.

Tree-ring dating relies on obtaining the growth pattern of trees from sample timbers of unknown date by measuring the width of the annual growth-rings. This is done to a tolerance of 1/100 of a millimetre. The growth patterns of these samples of unknown date are then compared with a series of reference patterns or chronologies, the date of each ring of which is known. When the growth-ring sequence of a sample 'cross-matches' repeatedly at the same date span against a series of different reference chronologies the sample can be said to be dated. The degree of cross-matching, that is the measure of similarity between sample and reference, is denoted by a '*t*-value'; the higher the value the greater the similarity. The greater the similarity the greater is the probability that the patterns of samples and references have been produced by growing under the same conditions *at the same time*. The statistically accepted fully reliable minimum *t*-value is 3.5.

However, rather than attempt to date each sample individually it is usual to first compare all the samples from a single building, or phase of a building, with one another, and attempt to cross-match each one with all the others from the same phase or building. When samples from the same phase do cross-match with each other they are combined at their matching positions to form what is known as a 'site chronology'. As with any set of data, this has the effect of reducing the anomalies of any one individual (brought about in the case of tree-rings by some non-climatic influence) and enhances the overall climatic signal. As stated above, it is the climate that gives the growth pattern its distinctive pattern. The greater the number of samples in a site chronology the greater is the climatic signal of the group and the weaker is the non-climatic input of any one individual.

Furthermore, combining samples in this way to make a site chronology usually has the effect of increasing the time-span that is under comparison. As also mentioned above, the longer the period of growth under consideration, the greater the certainty of the cross-match. Any site chronology with less than about 55 rings is generally too short for reliable dating.

Having obtained a date for the site chronology as a whole, the date spans of the constituent individual samples can then be found, and from this the felling date of the trees represented may be calculated. Where a sample retains complete sapwood, that is, it has the last or

outermost ring produced by the tree before it was cut, the last measured ring date is the felling date of the tree.

Where the sapwood is not complete it is necessary to estimate the likely felling date of the tree. Such an estimate can be made with a high degree of reliability because oak trees generally have between 15 to 40 sapwood rings. For example, if a sample with, say, 12 sapwood rings has a last sapwood ring date of 1400 (and therefore a heartwood/sapwood boundary ring date of 1388), it is 95% certain that the tree represented was felled sometime between 1403 (1400+3 sapwood rings (12+3=15)) and 1428 (1400+28 sapwood rings (12+28=40)).

Analysis

Each of the 12 samples obtained from the timbers to Prezzo was prepared by sanding and polishing to clearly show the individual annual growth rings, the widths of each ring on all 12 samples then being measured. These measured data were then compared with each other as described in the notes above. This comparative process indicated that a single group comprising 10 cross-matching samples could be formed, these 10 samples cross-matching with each other at relative positions as shown in the bar diagram, Figure 5.

The measured data of the 10 cross-matching samples were combined at their indicated off-set positions to form PREZSQ01, a site chronology with an overall length of 160 rings. This site chronology was then satisfactorily dated by repeated and consistent cross-matching with a high number of relevant reference chronologies for oak as spanning the years 1203 to 1362. The evidence for this dating is given in the *t*-values of Table 2.

Interpretation

One of the dated samples, PRE-Z11 (a purlin in range 1), in site chronology PREZSQ01, retains complete sapwood. This means that it has the last full growth ring produced by the tree represented before it was cut (this denoted by upper case ‘C’ in Table 1 and the bar diagram). This last full growth ring is dated 1362. However, under the microscope it is possible to see that the spring cell growth for the following year, 1363, has been laid down, but that no summer cell growth for that year is present. This would suggest that this timber was felled early in 1363.

Another sample, PRE-Z08 (a principal rafter in range 1) is from a timber which had complete sapwood on it but from which, due to its soft and fragile nature, a small amount of sapwood (a few millimetres) was lost in coring (this denoted by lower case ‘c’ in Table 1 and the bar diagram). The last extant sapwood ring on this sample is dated 1357. Allowing for the rings the lost sapwood (a few millimetres) might have contained, it is likely that this timber was also felled in 1363.

Of the remaining samples (PRE-Z04, Z06, Z07, and Z12) that retain it, the relative position and date of heartwood/sapwood boundary (h/s in table 1 and the bar diagram), and the number of sapwood rings they might have, is very similar to that on the two samples (PRE-Z08 and Z11) whose felling dates are known or closely estimated. As such this suggests that they were felled at, or at least about the same time.

Three samples, though (PRE-Z05, Z09, and Z10), are without the heartwood/sapwood boundary. As such it is, in theory, impossible to reliably say when the trees these timbers represent were felled because they may have gone on growing for any number of years beyond their last extant heartwood/ring dates.

However, such is the close degree of cross-matching between almost all these samples that it is likely that the trees they represent were all growing not only in the same wood, but possibly in the same copse or stand of woodland. Indeed, it is possible that the timbers represented by samples PRE-Z06 and 11 are in fact derived from the same tree, or at least two trees directly adjacent to each other. Given this lose degree of cross0=-matching it is perhaps more likely than not that all the timbers were cut as part of a single programme of felling, it being considered an unlikely coincidence that trees, once near neighbours of each other in the same woodland but felled at different times, would still come to be used together in the same building.

The overall inference therefore is that almost all these dated timbers were felled at one and the same time in 1363.

The one exception to this is represented by sample PRE-Z02, from the southern section of the tiebeam of truss 3, in range 2. This sample also retains complete sapwood (the last growth ring of the tree). Here, though, the last growth ring, and thus the felling of this tree, is dated 1293 (though, given the indistinct nature of this last sapwood ring, it is not possible to determine the season of the year). It may be of interest to note that, while the cross-matching between this sample and all the other samples is significant and acceptable in dendrochronological terms, it is less close than all the other cross-matching here, this suggesting that this tree has come from a different woodland.

Site chronology PREZSQ01 was then compared with the two remaining ungrouped samples (PRE-Z01 and Z03). There was, however, no further satisfactory cross-matching. These two ungrouped samples were, therefore, compared individually with the full corpus of reference data for oak. There was again no further satisfactory cross-matching, and both samples must, therefore, remain undated

Conclusion

From the analysis undertaken here, it would clearly appear that the majority of timbers to the Prezzo building date to the later fourteenth century, these mostly being felled in 1363. One timber, however, is earlier, and is presumably reused here, this timber being felled in 1293.

Woodland sources

As may perhaps be seen from Table 2, although site chronology PREZSQ01 has been compared with reference material from all parts of England, there is a distinct and clear trend for it to match best with other reference sites in south central/western England, with other sites in Wiltshire, Devon, Somerset, etc. being listed. While the exact location(s) of the source woodlands for the timbers used at these other sites are themselves not known, the matching seen here would suggest that the timbers used at Prezzo came from a similar, and probably local, regional source.

In particular, it will be seen that there is an unusually close match between the Prezzo timbers reported upon here and timbers from The Old George (in part of almost identical date), set further along the High Street (Arnold and Howard 2017 unpubl). Such is the cross-matching between these timbers that, wherever it was, it is likely that they have come from the same woodland.

Undated samples

Two samples, PRE-Z01 and Z03, remain ungrouped and undated, despite both of them having quite sufficient numbers of annual growth rings for reliable dating. Also, neither of them show any problems with their growth such as compression or distortion which might skew the weather signal by which they are cross-matched and dated. Given that both samples are from the tiebeams of trusses 3 and 4, which have been cut through or show some jointing, it is perhaps possible that these timers are of different dates (it may be significant that truss 3 contains at least one earlier timber, represented by sample PRE-Z02, which was felled in 1293). As such, this might make these samples ‘singletons’ and while single samples can sometimes be dated, it is often more difficult that dating well-replicated data from groups of cross-matching samples.

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Table 1: Details of tree-ring samples from Prezzo, 52–54 High Street, Salisbury, Wiltshire

Sample number	Sample location	Total rings	Sapwood rings*	First measured ring date (AD)	Heart/sap boundary (AD)	Last measured ring date (AD)
PRE-Z01	Tiebeam, truss 3 (north piece), range 2	71	17	------	------	------
PRE-Z02	Tiebeam, truss 3 (south piece), range 2	88	17C	1206	1276	1293
PRE-Z03	Tiebeam, truss 4 (south piece), range 2	90	23	------	------	------
PRE-Z04	Horizontal plate, truss 1 – 2, party wall range 1/2	102	h/s	1233	1334	1334
PRE-Z05	Main post, truss 2, party wall, wall range 1/2	95	no h/s	1222	------	1316
PRE-Z06	Brace from east side main post truss 2, wall 1/2	128	h/s	1203	1330	1330
PRE-Z07	Mid-rail, truss 1 – 2, party wall, range 1/2	96	2	1254	1347	1349
PRE-Z08	North principal rafter, truss 3, range 1	130	20c	1228	1337	1357
PRE-Z09	North purlin, truss 2 – 3, range 1	109	no h/s	1218	------	1326
PRE-Z10	North principal rafter, truss 2, range 1	77	no h/s	1246	------	1322
PRE-Z11	South purlin, truss 1 – 2, range 1	145	23C	1218	1339	1362
PRE-Z12	South queen stud, truss 1, range 1	112	15	1246	1342	1357

*C = sample retains complete sapwood, the last measured ring date is the felling date of the timber
c = timber has complete sapwood, but a portion has been lost from the sample in coring
h/s = heartwood/sapwood boundary, i.e., only the sapwood rings are missing

Table 2: Results of the cross-matching of site chronology PREZSQ01 and the reference chronologies when the first ring date is 1203 and the last ring date is 1362		
Reference chronology	*t*-value	
George Hotel, 13 High Street, Salisbury, Wiltshire	14.9	(Arnold and Howard 2017 unpubl)
Hardwick House, Banbury, Cherwell, Oxfordshire	9.6	(Bridge and Tyers 2020)
Abbey Barn, Glastonbury, Somerset	8.0	(Bridge 1981)
Exeter Cathedral, Exeter, Devon	7.8	(Arnold *et al* 2003)
Chichester Cathedral, West Sussex	7.7	(Howard *et al* 1992)
Wadhayes, Awliscombe, Devon	7.2	(Tyers *et al* forthcoming)
Meare Fish House, Porters Hatch, Meare, Somerset	6.9	(Bridge 2002)
9 Queen Street, Salisbury, Wiltshire	6.4	(Arnold and Howard 2018 unpubl)

Site chronology PREZSQ01 is a composite of the data of the cross-matching samples as seen in the bar diagram, Figure 5, below. This composite data set produces an 'average' tree-ring pattern, where the possible erratic variations of any one individual sample are reduced and the overall climatic signal of the group is enhanced. This 'average' site chronology is then compared with several hundred reference patterns covering every part of Britain for all time periods, cross-matching with a number of these only at the date span indicated. The Table gives only a small selection of the very best matches as represented by '*t*-values' (ie, degrees of similarity). It may be noticed from this that the resultant *t*-values are well in excess of the *t*=3.5 value usually taken as the minimum acceptable level for satisfactory dating.

Also of note is that although site chronology PREZSQ01 has been compared with reference material from all parts of England, there is a distinct and clear trend for it to match best with other reference sites in south central/western England, with other sites in Wiltshire, Devon, Somerset, etc. being listed. While the exact location(s) of the source woodlands for the timbers used at these other sites are themselves not known, the matching seen here would suggest that the timbers used at Prezzo came from a similar, and probably local, regional source.

In particular, it will be seen that there is an unusually close match between the Prezzo timbers reported upon here and timbers from The Old George (in part of almost identical date), set further along the High Street. Such is the cross-matching between these timbers that, wherever it was, it is likely that they have come from the same woodland.

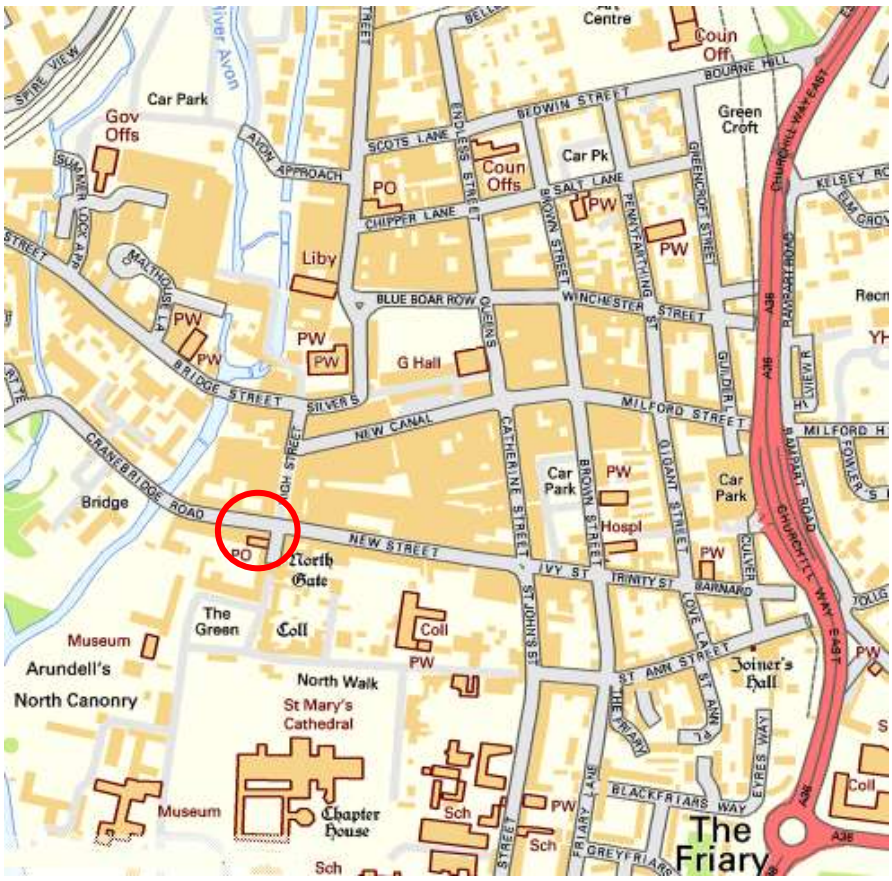


Figure 1a/b: Maps to show location of Salisbury (top) and Prezzo (bottom)

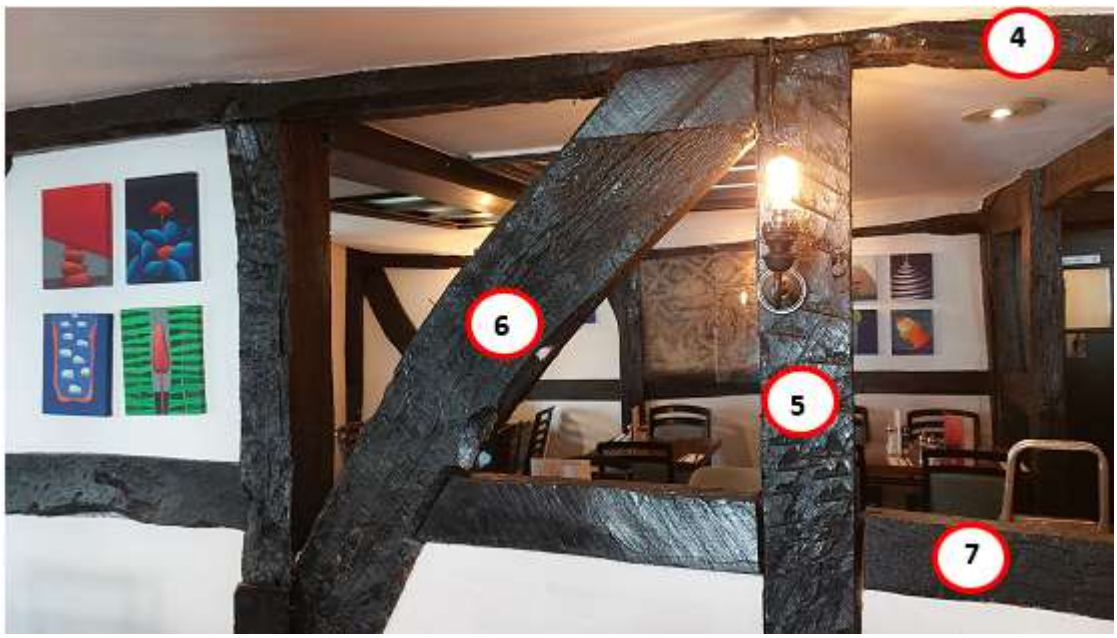


Figure 2a/b: Annotated photographs to help identify sampled timbers (see Table 1 and Figure 3)

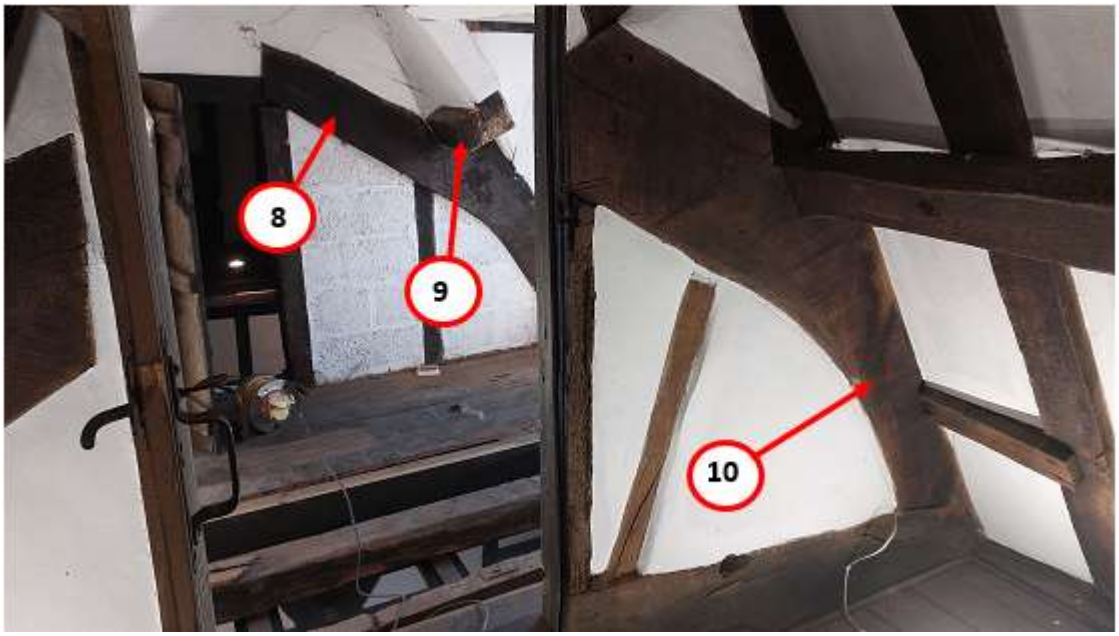


Figure 2c/d: Annotated photographs to help identify sampled timbers (see Table 1 and Figure 3)

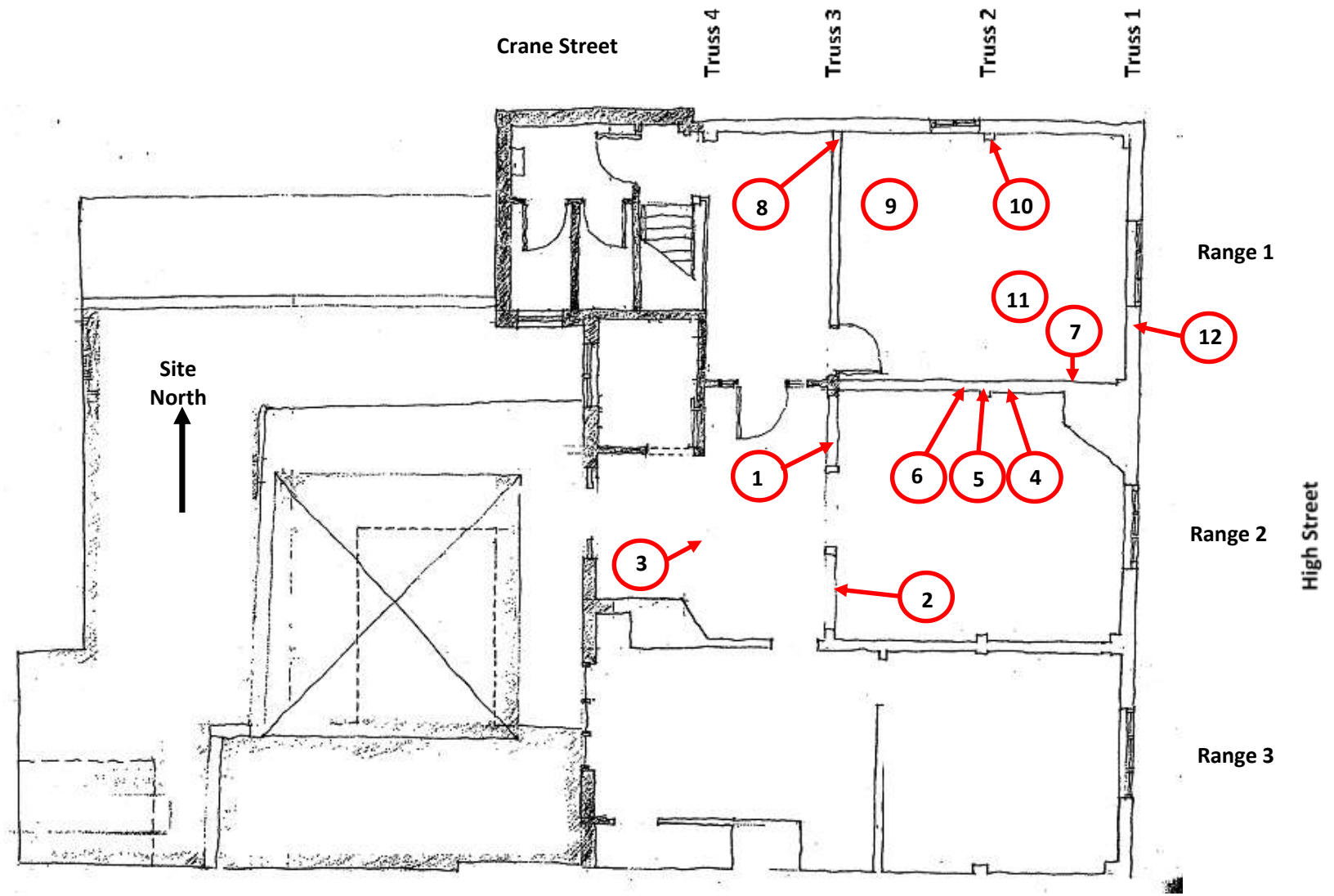


Figure 3: Plan of Prezzo at first floor level to show approximate position of the sampled timbers (see Table 1 and Figures 2a–d) (after Wiltshire Building Record)

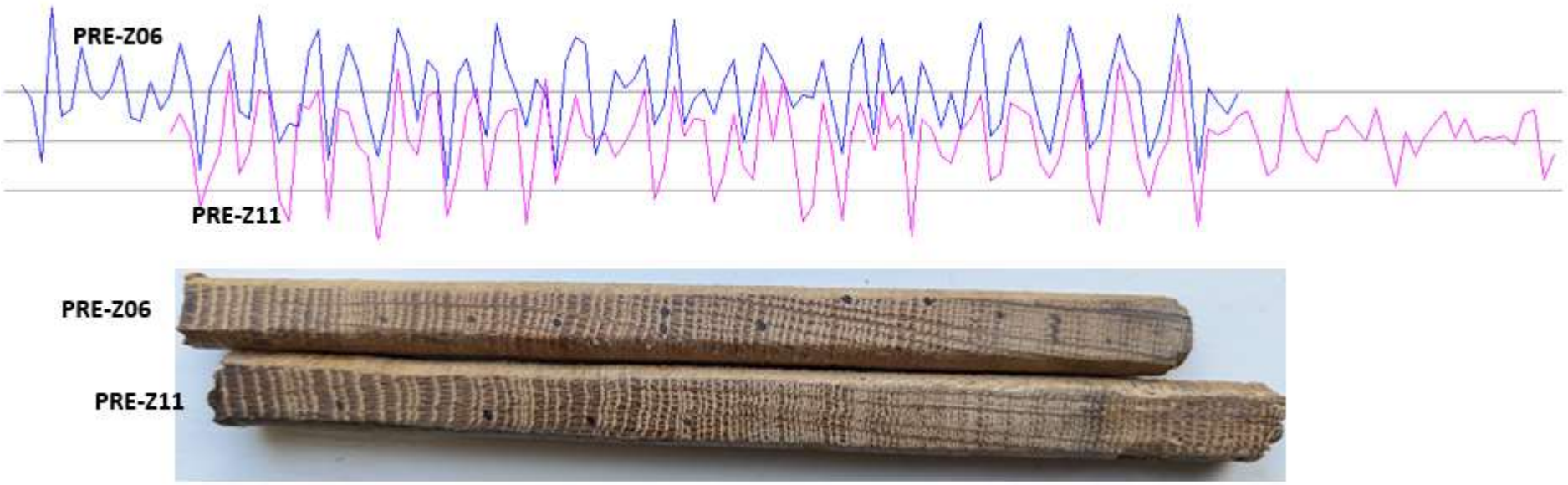
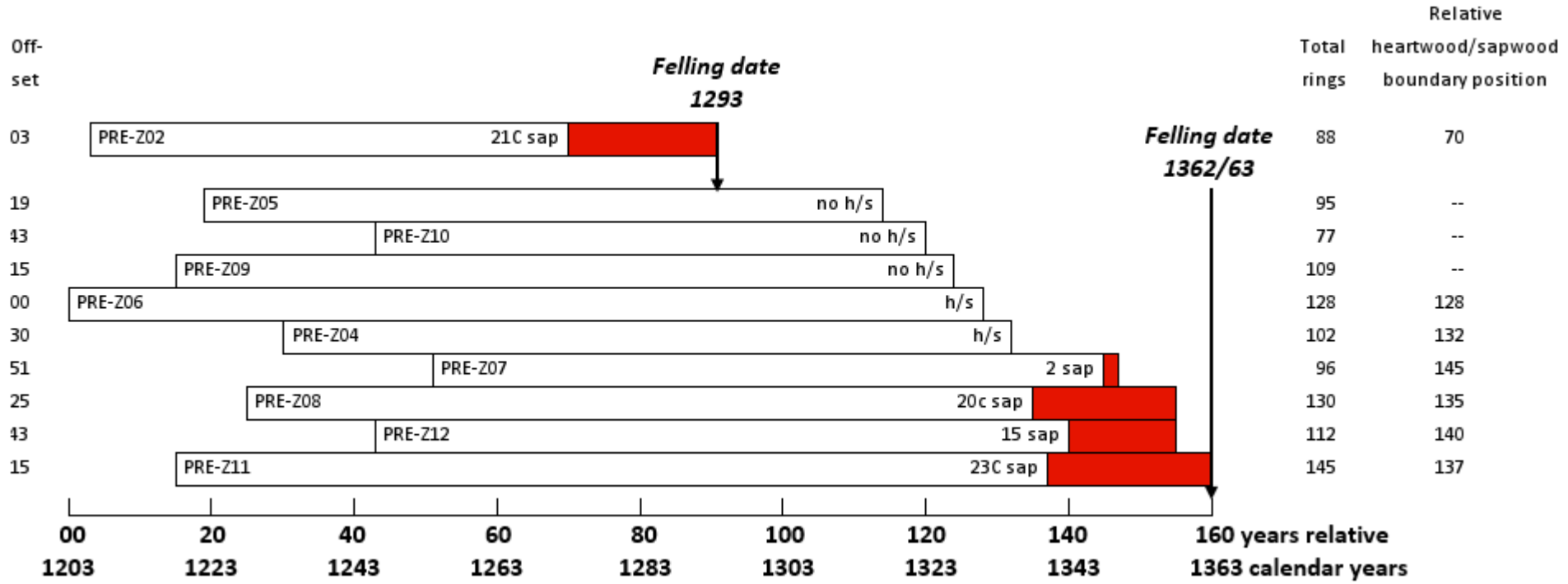


Figure 4: Graphic representation of the cross-matching of two samples, PRE-Z06 and PRE-Z11

When cross-matched at the correct positions, as here, the variations in the rings of these two samples (where they overlap with each other) correspond with a high degree of similarity. As the ring widths of one sample increase (represented by peaks in the graph), or decrease (represented by troughs), so too do the annual ring widths of the second sample. This similarity in growth pattern is a result of the two trees represented having grown at the *same time* in the *same place* (although in this example, it is likely that both timbers have been derived from the same tree*).* The growth ring pattern of two samples from trees grown at different times would never correspond so well.



blank bars = heartwood rings; filled bars = sapwood rings

C= sample retains complete sapwood, the last measured ring date is the felling date of the timber

c = timber has complete sapwood, but a portion has been lost from the sample in coring

h/s = heartwood/sapwood boundary, i.e., only the sapwood rings are missing

Figure 5: Bar diagram of the samples in site chronology PREZSQ01

The constituent samples of site chronology PREZSQ01 are shown above in the form of 'bars' at positions where the pattern of their growth rings cross-match with each other, the similarity being caused by the trees used for the beams sharing common periods of growth which overlap with each other, and having grown in the same woodland, or in woodlands close to each other. The data of the measured rings widths of the samples have been combined to form a 'site chronology' which has then been dated by comparison with the 'reference' chronologies (see Table 2).

One sample, PRE-Z11, retains complete sapwood, ie, it has the last full growth ring produced by the tree before it was cut, this ring dated 1362. Under the microscope it is possible to see that the spring cell growth for the following year, 1363, has been laid down, but that no summer cell growth for that year is present. This would suggest that this timber was felled early in 1363. Another sample, PRE-Z08, has near-complete sapwood, its last extant sapwood ring being dated 1357. Allowing for likely lost sapwood (a few millimetres), it is likely that this timber was also felled in 1363. The relative position and date of the heartwood /sapwood boundary on the majority of those samples that retain it, and the cross-matching between all samples would suggest that almost all the timbers represented were felled at one and the same time in 1363.

It will be seen however, that one sample, PRE-Z02, represents an earlier timber. This sample also has complete sapwood, the last sapwood ring, and thus the felling of the tree being dated to 1293.